



# **Biosurveillance: Detecting, Tracking, and Mitigating the Effects of Natural Disease and Bioterrorism**

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# Outline of Presentation

- Define biosurveillance and provide examples of systems currently in use
- Describe conditions that led to creation and implementation of biosurveillance systems
- Outline technical, managerial, and inter-organizational challenges in effectively implementing and operating systems
- Discuss importance of collaboration and aligning goals among interagency and other organizational partners



# What is Biosurveillance?

- Homeland Security Presidential Directive HSPD-21 (October 18, 2007):
  - “The term „biosurveillance” means the process of active data-gathering ... of biosphere data ... in order to achieve early warning of health threats, early detection of health events, and overall situational awareness of disease activity.” [1]
  - “The Secretary of Health and Human Services shall establish an operational national epidemiologic surveillance system for human health...” [1]
- **Syndromic surveillance:**
  - “...surveillance using health-related data that precede diagnosis and signal a sufficient probability of a case or an outbreak to warrant further public health response.” [2]

[1] [www.whitehouse.gov/news/releases/2007/10/20071018-10.html](http://www.whitehouse.gov/news/releases/2007/10/20071018-10.html)

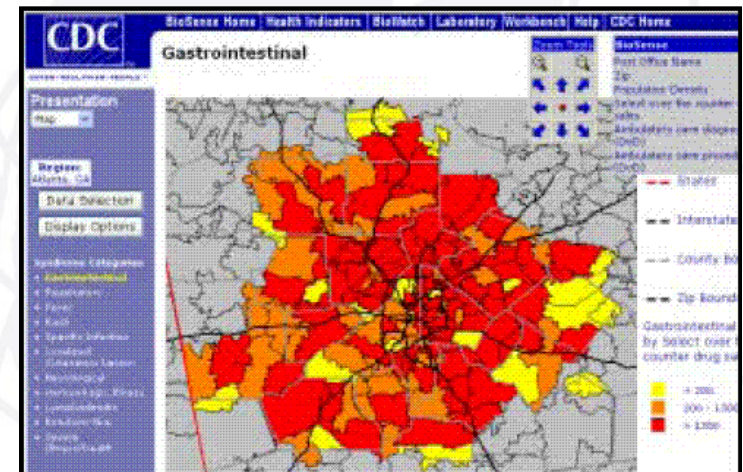
[2] CDC ([www.cdc.gov/eпо/dphsi/syndromic.htm](http://www.cdc.gov/eпо/dphsi/syndromic.htm), accessed 5/29/07)





# Purpose: Early Event Detection and Health Situational Awareness

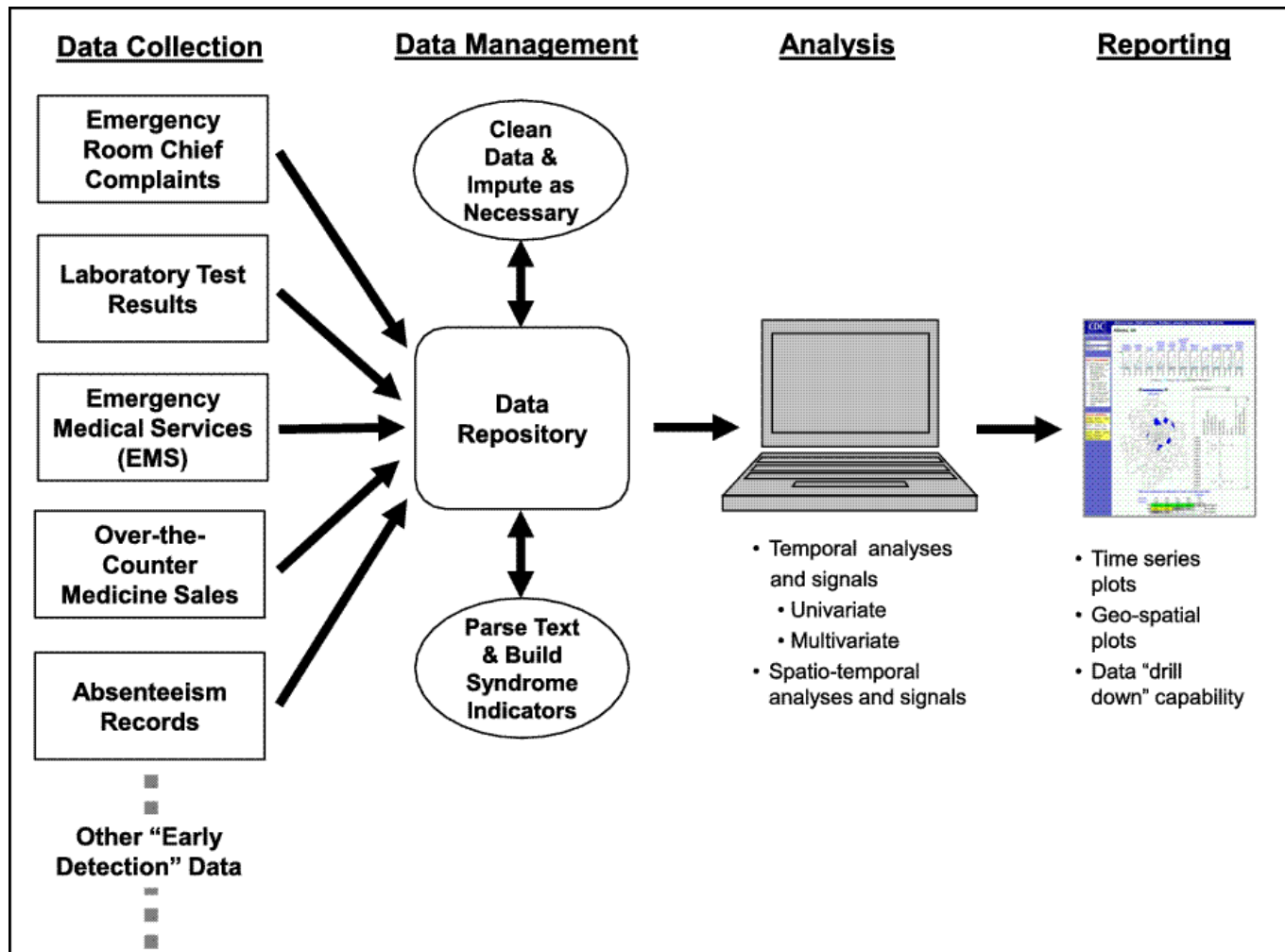
- “**Early Event Detection** (EED) is the ability to detect at the earliest possible time events that may signal a public health emergency. EED is comprised of case and suspect case reporting along with statistical analysis of health-related data.” [1]
- “**Health Situational Awareness** is the ability to utilize detailed, real-time health data to confirm, refute and to provide an effective response to the existence of an outbreak. It also is used to monitor an outbreak’s magnitude, geography, rate of change and life cycle.” [1]



[1] CDC (<http://www.cdc.gov/BioSense/publichealth.htm>, accessed 10/11/08)



# It's a Never-Ending Analysis

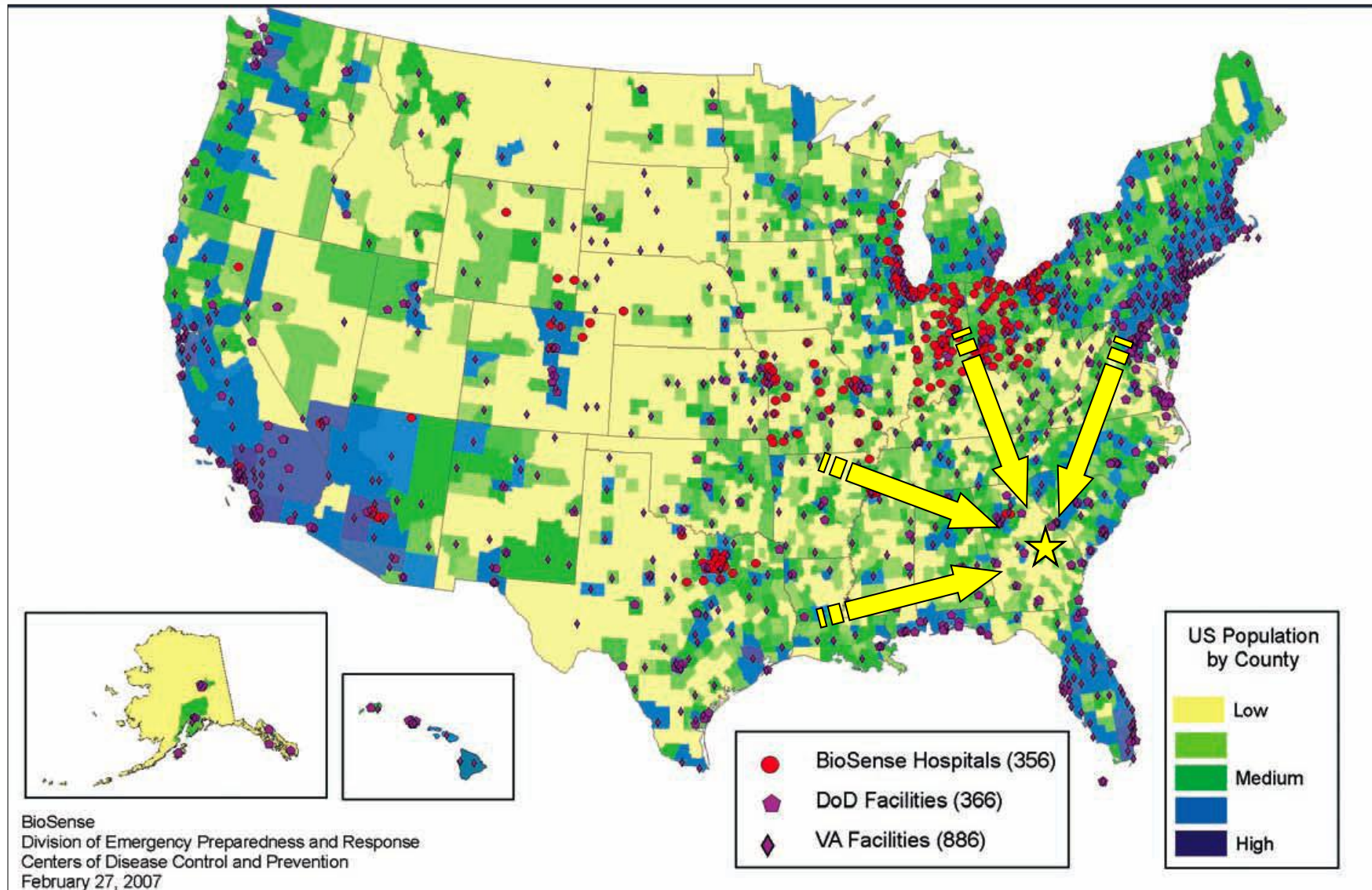


*Data acquisition, analysis, and decision making repeated daily.*



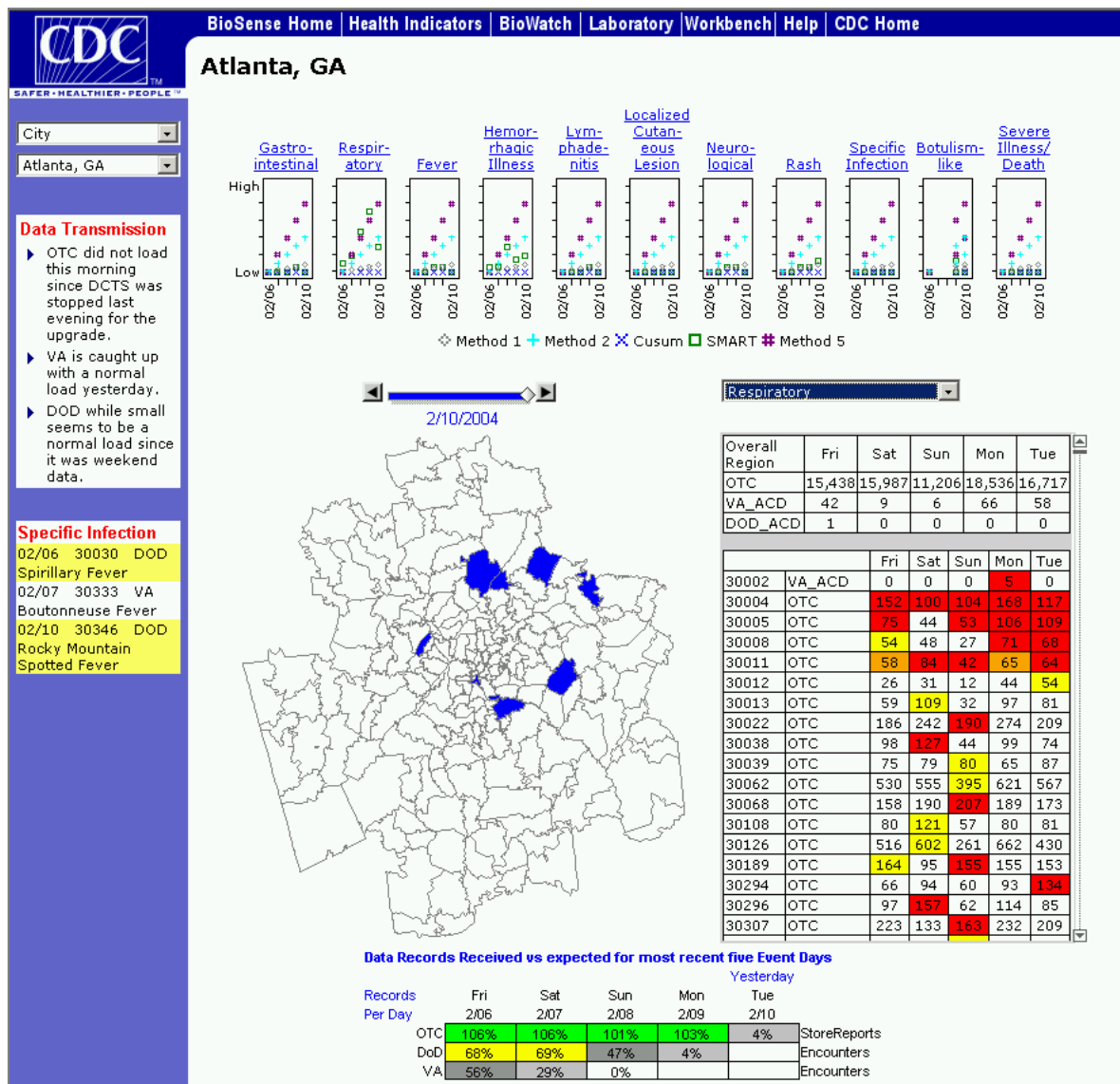


# An Existing System: BioSense





# BioSense Display





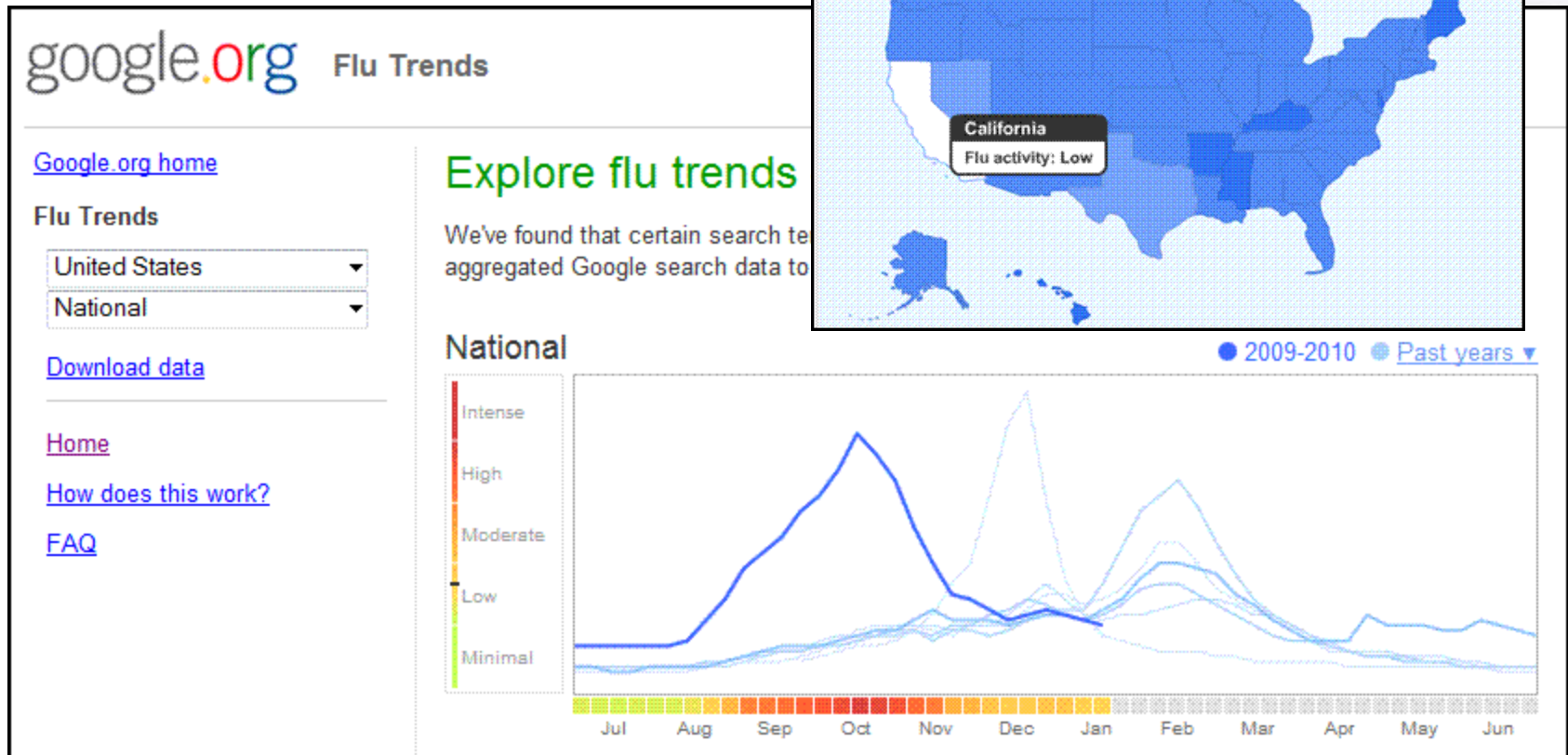


# Other Biosurveillance Systems

- **Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE)**
  - Developed and operated by the DoD
  - ESSENCE IV monitors for infectious disease outbreaks at more than 300 military treatment facilities worldwide
  - ESSENCE II monitors military and civilian outpatient visit data as well as over-the-counter pharmacy sales and school absenteeism in the Washington DC area
- **Early Aberration Reporting System (EARS)**
  - Developed by the CDC
  - Originally designed to monitor for bioterrorism during large-scale events that often have little or no baseline data
  - Now used by various state and local public health departments for routine health surveillance purposes
    - E.g., Monterey County Health Department uses EARS to monitor emergency room data from the county's hospitals and clinics daily



# Latest Entry: Google Flu Trends



See [www.google.org/flutrends/](http://www.google.org/flutrends/)



# How Good is Google Flu Trends?

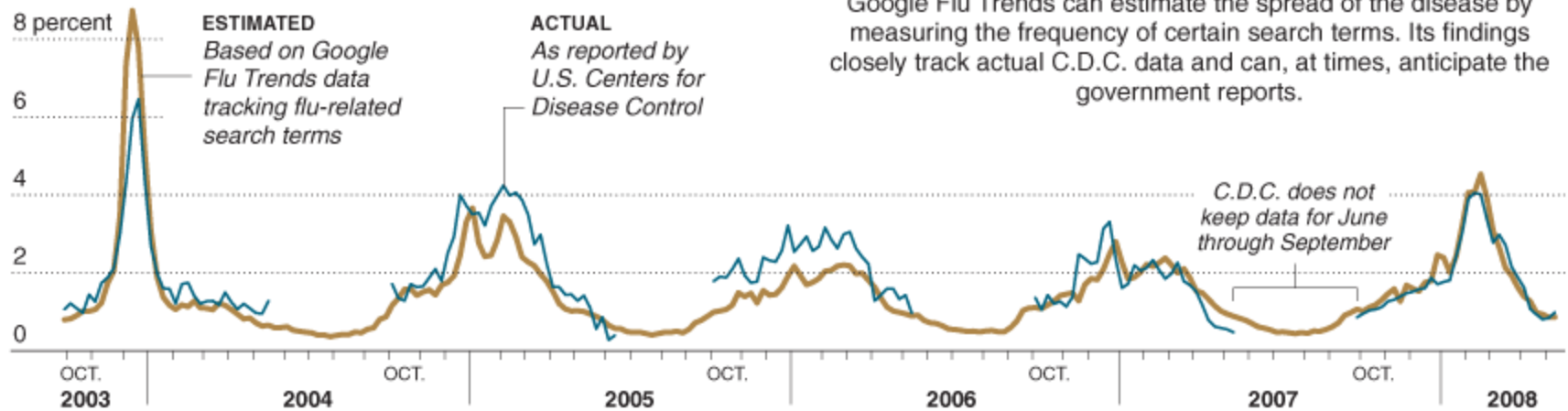
The New York Times

November 12, 2008

PERCENT OF HEALTH VISITS FOR FLU-LIKE SYMPTOMS Mid-Atlantic region

## Using Google to Monitor the Flu

Google Flu Trends can estimate the spread of the disease by measuring the frequency of certain search terms. Its findings closely track actual C.D.C. data and can, at times, anticipate the government reports.



Sources: Google; Centers for Disease Control

THE NEW YORK TIMES

- Google search results correspond to CDC “sentinel physician” data
- Google says it was able to accurately estimate flu levels 1-2 weeks faster than published CDC reports



# Conditions Driving Implementation

- Rise of militant extremism
  - Real concern that terrorist might try to use virulent bio-agent
- 9/11 and subsequent Anthrax attacks
  - Provided political imperative to improve homeland security
- Advances in computer and Internet technology
  - Near real time data collection and dissemination made possible



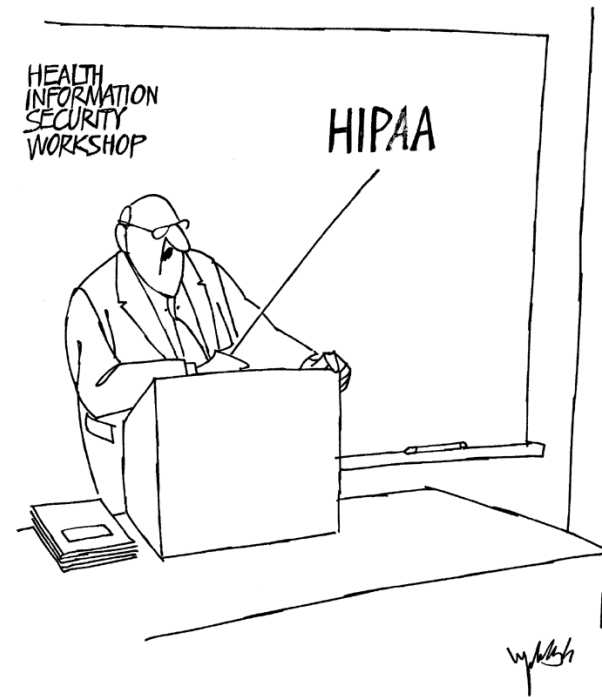


# Challenges to Implementation

- **Legal and regulatory** in order to gain access to data
- **Technological** related to designing and implementing computer hardware and software for collecting and assembling data
- **Ethical and procedural** issues inherent in managing and safeguarding data
- **Analytical** challenges of assessing the likelihood of outbreaks and of displaying data to enhance situational awareness.
- **Managerial** challenges of effectively assembling and operating the entire system

# Managerial Planning Considerations

- Goals - public service vs business
- Network type
- Executive sponsor
- Technological
- Legality
  - Data confidentiality
  - Memorandums of Understanding
- Sustainability



*"No, it's not a female Hippopotamus, anyone else know?"*



# Solutions to Implementation

- Align goals between health care institutions
- Use products that best fit your need
- Be creative with funding
- Create partnerships with academia





# Importance of Collaboration

## MCHD

Real world data sets  
Applied needs and skills

## NPS

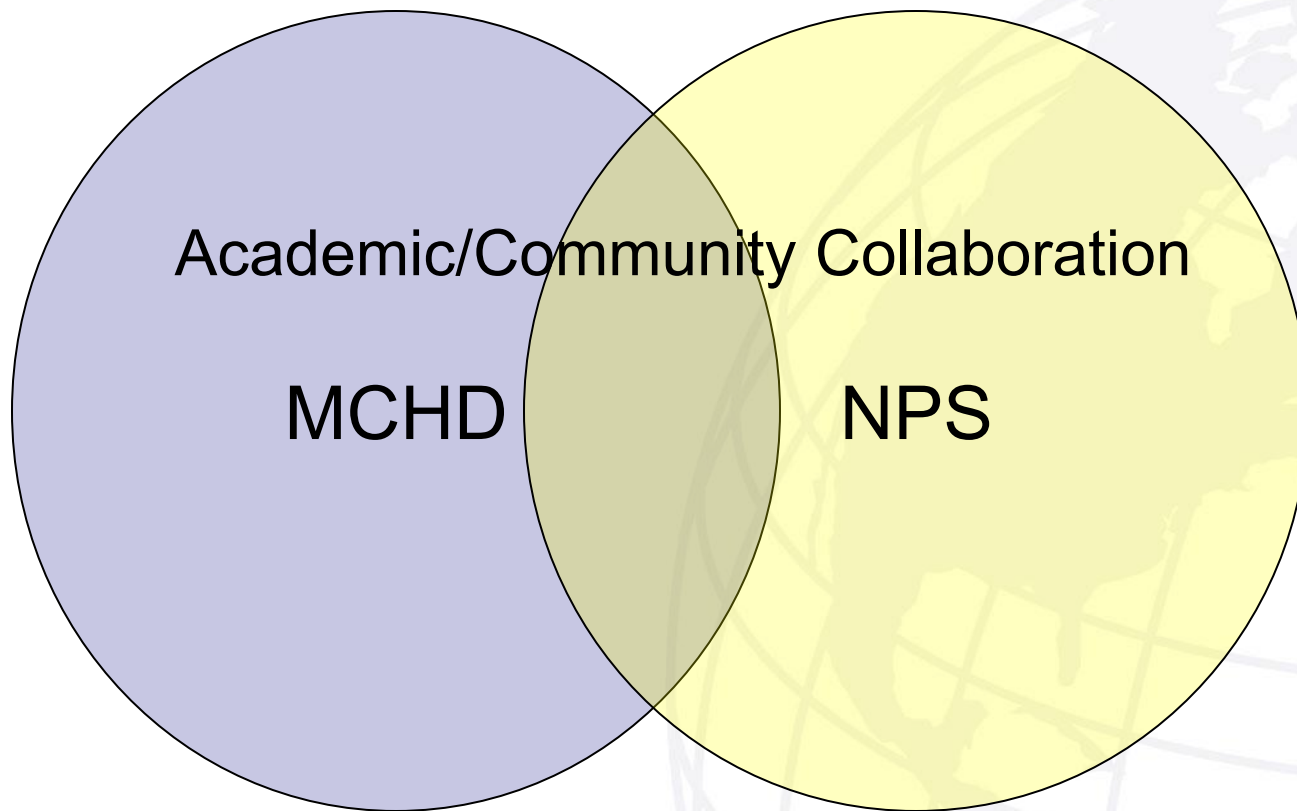
Statistical expertise  
Dedicated research time





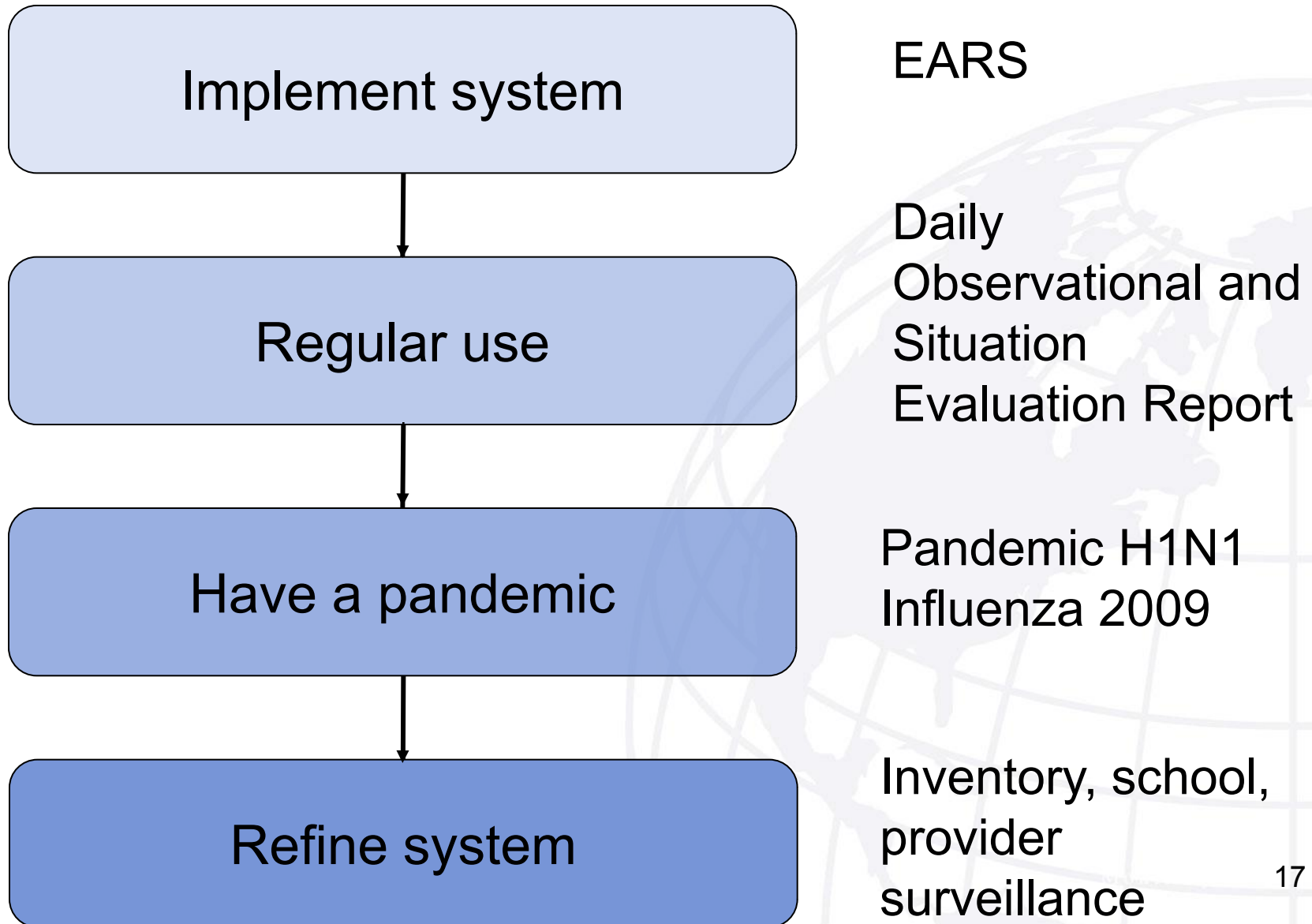
# Importance of Collaboration

## Intersection of Goals





# Importance of Events





# Conclusions and Take-Aways

- National security issues now span all levels of government
- Analytical challenges are significant
- Plan, but be flexible
- Be aware of limitations of biosurveillance systems
- Be open to new partnerships



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